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INSTITUTE OF PETROLEUM REVIEW

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Published by The Institute of Petroleum
26 Portland Place, London, W.1
Telephone: LANgham 2250 Telegrams: Instpetech, Westdo, London
Volume 3. No. 28. April 1949. Price 2/-. Annual Subscription: One Guinea

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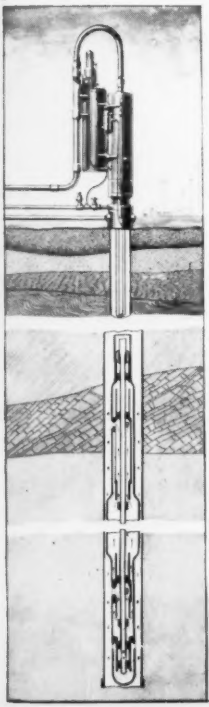

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INSTITUTE OF PETROLEUM REVIEW

Hon. Editor: F. H. Garner, O.B.E., Ph.D., F.R.I.C.
Hon. Associate Editor: E. B. Evans, Ph.D., M.Sc., F.R.I.C.
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No. 28 **APRIL 1949** Vol. 3

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THE ANNUAL DINNER

The first post-war annual dinner of the Institute of Petroleum was held at the Savoy Hotel, London, on March 1, 1949, when the President, E. A. Evans, presided over a gathering of over 450 members and their guests.

The guest of honour was the Rt. Hon. Hugh T. N. Gaitskell, P.C., C.B.E., the Minister of Fuel and Power. Sir Frederick Bain, Kt., M.C. (*Federation of British Industries*) and Sir Andrew Agnew, C.B.E. (*immediate past-president*), were among the official guests, who included also B. Barnes, V. Butler, Dr Roxbee Cox, and Sir Donald Fergusson (*Ministry of Fuel and Power*), Professor G. I. Finch (*Physical Society*), Sir Frederick Godber (*Shell Transport and Trading Co. Ltd.*), Sir I. Heilbron, Kt., F.R.S. (*Chemical Society*), E. F. E. Howard (*Council of British Manufacturers of Petroleum Equipment*), R. L. Jacque (*Institut Français du Pétrole*), Dr L. H. Lampitt (*Society of Chemical Industry*), Sir P. Manson-Bahr, Kt., C.M.G., D.S.O. (*Royal Society of Tropical Medicine*), Dr G. Roche Lynch (*Royal Institute of Chemistry*), F. A. Martin (*British Steel Founders' Association*), L. F. Murphy (*Ministry of Fuel and Power*), Vice-Admiral H. A. Packer (*Fourth Sea Lord*), Dr A. Parker (*Fuel Research Station*), R. N. Quirk (*Ministry of Fuel and Power*), B. G. Robbins (*Institution of Mechanical Engineers*), A. Robens, M.P. (*Parliamentary Secretary, Ministry of Fuel and Power*), Dr S. E. Taylor (*Institute of Mining and Metallurgy*), Dr D. T. A. Townsend (*Institute of Fuel*), G. L. Watkinson, C.B., M.C. (*Ministry of Fuel and Power*).

Among the members of Council present were Colonel S. J. M. Auld, O.B.E., M.C., T. Dewhurst, and Professor F. H. Garner, O.B.E. (*past-presidents*); Dr E. B. Evans, H. Hyams, C. A. P. Southwell, M.C., and H. C. Tett (*vice-presidents*); A. T. Beazley, M.B.E., C. T. Brunner, E. J. Dunstan, F. L. Garton, T. F. Laurie, F. Morton,

J. S. Parker, H. E. F. Pracy, D. L. Samuel, E. J. Sturgess, G. H. Thornley, E. Thornton, R. R. Tweed, H. de Wilde, and A. T. Wilford (*Members of Council*).

"THE INSTITUTE OF PETROLEUM"

THE RIGHT HON. HUGH T. N. GAITSKELL, P.C., C.B.E. (Minister of Fuel and Power), said:

"I consider it a great honour to be invited here this evening and to be given the opportunity to propose the toast of 'The Institute of Petroleum'. From the time when I became Minister I have had nothing but the happiest relations with the oil industry.

"This Institute has had among its presidents a number of exceedingly distinguished men. Unfortunately, I did not know very many of them; but I do know one of them fairly well. He is Sir Andrew Agnew (applause). If he will allow me to say so, I have always been extremely impressed by the splendid work that he did during the war and in the two years after the war as Chairman of the Petroleum Board; that needs no emphasis from me at this gathering (hear, hear).

"I understand that not long ago the Institute changed itself from an Institution of Technology to just a plain Institute, and that the technicians were good enough to allow into their midst people such as petroleum economists and administrators, or, as one should really call them, bureaucrats! (laughter). After all, bureaucrats are to be found not only in the Civil Service! For my part, speaking as one who once made his living by teaching economics and who, since giving that up, has been for the most part a bureaucrat, I welcome this opening of arms by the technicians. I am sure that nothing but good can come from this mixing of the classes because, when all is said and done, none of the real problems of the industry can be solved by technicians alone, any more than they can be solved by bureaucrats alone. Therefore, the more the technicians can understand the bureaucrats' point of view and the bureaucrats can understand the technicians' point of view, the better.

"Now I would like to say that we in the Ministry hope that you will have very

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close relations with us. We are really anxious that in connexion with the many problems which inevitably face the Government as well as the industry there can be really close co-operation, and that when we are puzzled about some technical problem maybe, or a problem which may stretch beyond the purely technical, there shall be a body from which we can be sure of getting objective and unprejudiced advice. I am sure the Institute will be extremely helpful to us in that way.

Government Councils

"We are making one or two changes in the relationship of the Government to the oil industry, to which I ought to refer. When the Petroleum Board was dissolved we set up, in agreement with the industry, two committees, and also an Oil Consumers' Council. I do not propose for the moment to say anything about the committees, but I would like to say a word about the Council, which I believe is to hold its first meeting next week. I am very glad to say that we have been able to secure that your president, Mr Evans, will represent the Institute on that Council. I have no doubt whatever that, not only will he prove to be very useful at its meetings and in the work it has to do, but he will also provide a link between the Council and the Institute.

"We have also set up quite recently a Scientific Advisory Council for Fuel and Power. The functions of the Minister undoubtedly include what is called 'co-ordination' in the field of research in fuel and power. Co-ordination is a vague, sometimes a rather unsatisfactory, word. But I think that in the sphere of fuel and power there is a strong case for some degree of co-ordination in research. On the Advisory Council we have representatives of the nationalized industries—the Coal Board, the Gas Council, and the Electricity Authority—and we have also a representative of the oil industry, Professor Garner (applause).

"So that I think that, so far as concerns personnel—if I may say so with some pride—we have done pretty well. The Council undoubtedly will be concerned with petroleum problems, as with other problems of fuel and power; and I know

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that the Chief Scientist at the Ministry, Dr Roxbee Cox, who is, of course, a member of the Council, has himself been particularly interested in this field. He is immensely impressed by the research work which is actually being carried out by the oil industry in Great Britain now. At a time when we are being criticized for not taking research seriously enough, it is really a pleasure to congratulate you on what you are doing in that field.

World Oil Changes

"Looking back over the ten years since the last annual dinner of the Institute, there have been some remarkable changes in the oil world. There has been, of course, the extremely large increase of production and an equally large increase in consumption. But the pattern of world output and trade in oil has changed considerably in various ways. The United States, of course, still dominates the scene; its output is far greater than that of any other country and, indeed, greater than that of the rest of the world put together. But what is significant is not so much that production has increased, but that consumption in the United States has soared so high that it has now reached the level of 300 million tons a year, or very nearly; so that it is more than the consumption of the whole world in 1938. The result of this is that the United States, instead of being a substantial exporter, is now on balance an importer of oil. That, I suggest to you, leads to various consequences. First, it means that at a time of shortage, we, and the rest of the world, sometimes experience some very awkward moments, because an unexpected increase of 5 per cent in the United States' consumption may make things very difficult indeed for other countries. After all, our total consumption is only just about 15 million tons a year, which is about 5 per cent of the United States' consumption. I must confess that during the last year or two there have been some very awkward moments like that.

"Other consequences, I think, are still more interesting. This change in the pattern of world output and trade means that the rest of the world, and for that matter the United States to some extent, is certain to become far more dependent on other sources of supply than in the past; and, of course, the source which one is bound to mention here is the Middle East. There seems to me to be no doubt whatever that in the years to come, in world trade particularly, as contrasted with world output, Middle East oil is bound to play a larger and larger part. The figures are already sufficiently striking. The output of oil in the Middle East in 1938 was 16 million tons; last year it rose to nearly 60 million tons, and there is a fairly good prospect that in 1951 it will reach 100 million tons. Of course, a large part of this increase will come from British-controlled or part British-controlled companies. You can deduce from that, I think, one rather cheering conclusion—that the development of the world's oil resources in the next few years should help materially to reduce the dollar deficit with which we are struggling.

British Enterprise

"Sometimes we find people who do not altogether appreciate the rather astonishing situation so far as the British oil companies are concerned. Here we are in the British Commonwealth itself producing about 2 per cent of the world's oil supply. Yet British companies develop and handle 50 per cent of the world's trade in oil. Without going into elaborate figures, one can readily understand the immense advantages that that brings to Britain by way of foreign exchange at a time when we are in great foreign exchange difficulties. When one considers, too, that a single oil refinery, that at Abadan, is worth just about as much as the total sum awarded to the coalowners of Britain for the whole of the British coal industry, one gets an impression of the immense scale

of the industry in which you are concerned.

"I would like to pay my tribute to the enterprise of the British companies which have won this position for the country in the past. I have already said that I have cordial relations with them; but I would like them to know that I have been extraordinarily impressed by the efficiency with which their businesses are managed. They have not always very easy problems to handle; sometimes extremely awkward diplomatic corners have to be turned. Again, for some reason oil always does seem to be discovered in the most difficult places; that is my main grievance against the industry. If it were very much more within our control, how much easier it would be! But, all in all, it is a remarkable achievement, and I do not think there can be very much doubt that as Middle East oil is developed we shall reap a very considerable harvest.

"One other development to which I ought to refer in that connexion is that of home refining. I do not need to emphasize to you the peculiarly difficult dollar problem which the country faces. The development of home refining will, I believe, contribute very greatly to the solution of that problem. The plan is to increase the throughput of the refineries, already running at something like 5 million tons a year, to over 20 million tons a year; and I suppose by that time we shall be importing very little in the way of refined products. Before we get there, of course, we have to put through a tremendous programme which involves an enormous amount of steel and a very great deal of equipment. I would ask those who would like to see refineries going up, so to speak, in the night to be a little patient. In the sphere of fuel and power there are also other problems involving a great deal of steel and equipment, and they, too, are very important for the economy of the country.

"Talking of equipment, I should refer also to the very remarkable increase there has been in the manufacture of refinery equipment in Great Britain. After all, I think it is fair to say that before the war we were almost wholly, or to a very large extent, dependent on the United States for any equipment of that kind. The fact is that the output of this equipment is now three times the pre-war level, and without this increase I do not see how we could possibly carry through the refinery programme.

"At the moment, of course, oil is still a fairly heavy item so far as dollar expenditure is concerned. I will not go into all the complications of that, for you know them pretty well. But we can, I think, feel that in regard to the development of production and refinery capacity we are batting on a pretty safe wicket. We can be confident that this part of Britain's recovery will go ahead, always assuming that international complications do not supervene, and that, as it goes ahead, the dollar picture so far as oil is concerned will look very different indeed at the end of three or four years. In fact, one can say that the oil companies are certainly going to contribute very materially to solving the dollar problem, the greatest problem which faces, not only Britain, but the whole of Western Europe; and we can leave it safely with them.

"Mr Chairman, it has been a pleasure to me to be with you this evening and to have the opportunity of proposing the toast of the Institute.

"I ask you to rise and drink to 'The Institute of Petroleum', and I couple with the toast the name of your President, Mr E. A. Evans."

The President Replies

The President, responding, said:

"The carefully chosen, elegant and eloquent words which we have just heard from the Minister of Fuel and Power must make us in the Institute of Petroleum feel very proud. He has neither attempted nor achieved the impossible task of overstating our merits! With

characteristic Government generosity he has wandered a little away from his own Department to find for us a pill made wholly of sugar to stimulate our hearts. Stimulated or not, it matters little whether we look to the right or to the left, we can see in the centre of our activities a man for whom we have a very great respect, and whose presence we greatly appreciate (hear, hear).

"Mr Gaitskell has been entrusted with great responsibilities which demand knowledge and understanding. Doubtless he has had plenty of solid troubles to disturb him in this world which is becoming more and more fluid-minded!

"From my long association with industrial research I am convinced that a sympathetic regard for scientific research is an essential qualification for high office in any British Government. The manner in which successive Governments have encouraged the Department for Scientific and Industrial Research is a clear indication of the accepted importance of scientific research. If any business man should need proof of this statement he can find it in the Finance Act, 1944. I am sure that if we had occasion to seek the support of Mr Gaitskell in any of our schemes he would use the words of the Psalmist: 'Call upon me in the day of trouble: I will deliver thee'. Being a cautious man, he might even complete the quotation in the words, 'and thou shalt deliver me' (laughter).

"Scientists are not usually eager to take excursions into publicity campaigns, but we are not averse to a little publicity when we are a little more proud than usual of our influence and prestige. As we are assembled in force this evening we might draw attention to our strength and importance, and even our magnates.

"Magnates are not to be confused with magnets. The magnates, you will remember, pick up the currency, and the magnets produce attractive lines when the currency is switched on.

"Collectively, we have reached a position of considerable responsibility. But, let us never forget that it is the individual that counts. It is the individual that produces the supreme works of art and science which humanity treasures. This Institute acknowledges with pride the prestige it has received from Sir Boverton Redwood, Lord Greenway, Lord Cadman, and Sir Andrew Agnew—all past-presidents. But there are others, some famous, some less famous, who have given superlatively great services to our advancement, men with a flexibility, who can turn instantly to deal with a necessary detail, men who can see the potentiality while it is still unverified, men whose responsibility it is to visualize the future, not by one or two years, but by five years. Those who are associated with scientific research know that five years is a reasonable interval between the time when a scientist conceives an idea and when the commercial man derives profit from it. Five years may seem a long time, but while it is comparatively easy to create new things, it is much more difficult to create new usable things.

"These men live by day in paladian palaces in an atmosphere of aristocratic elegance. And so it should be. Good men should be well housed. The brilliance, however, is not from the buildings, but from the men who work in them. To speak of such things to eminent persons who have adorned one of the most brilliant periods of time may seem a little out of place, but

He who whispers down the well
About the goods he has to sell
Will never make so many dollars
As he who climbs the hill and hollers

"Sir Edward Appleton recently said 'Science is now too important to be left entirely to scientists'. We in the Institute of Petroleum anticipated this opinion over ten years ago when we opened our doors to administrators and economists who are well versed in the petroleum industry. To say we have 'let them in' is

to use not quite the right term. We would not 'let anybody in'; we would welcome them. That is what we have done. So now we can claim to have every branch of the petroleum industry represented in our Institute.

"Our members are scattered over the face of the world, some looking for oil, some producing it, and others refining it. These men are upholding the best traditions of the British race.

"This great body of men, wherever they may be, has one ambition—the uplift of petroleum products. To realize this ambition in its entirety there must be a closer co-operation with the companies operating within the industry. Lately we have made it possible for business organizations to join us as Member-Companies. With their aid we can augment the activities which we are performing so successfully with the united aid of the A.S.T.M. and other overseas societies.

"I cannot let this opportunity pass without a word of appreciation to those British scientific societies and British scientists who have helped us in various ways.

"Mr Minister, you have made us feel more than ever proud of our achievements, and I thank you very much indeed for your kind words in wishing us well."

"THE PETROLEUM INDUSTRY"

SIR FREDERICK BAIN, KT., M.C. (President, Federation of British Industries), proposing "The Petroleum Industry", said:

"As President of the Federation of British Industries, I am privileged to have been asked to propose this toast of 'The Petroleum Industry'; but I am proud as a member of the chemical industry to come here and salute this great sister industry.

"This great industry was founded by people who had brains and used them, who had enterprise and courage; those are still the qualities that are necessary. We have got to have the educated brain; there is no industry which has paid such tribute to that educated intelligence, there is no industry that has shown such munificence in founding and encouraging scientific education and scientific research as has this industry represented here to-night. I wish to pay tribute to, and express the gratitude of all industry in Britain to, the Shell Companies for their magnificent foundation of the School of Chemical Engineering at Cambridge (applause).

"We in Britain, ravished and impoverished by two great wars, have allowed ourselves, or seem to have allowed ourselves, to be dominated by the bureaucrats; but in fact we have not. We have imposed discipline upon ourselves; as wise, politically educated people, we know we have to face restrictions, we have to face poverty, because we believe in the future, and we know how we are going to achieve success in the future. Let no one go away with any idea that there is any virtue in austerity and restrictions in themselves. Not at all, but there is virtue in that austerity and in those restrictions which we willingly allow ourselves to undergo for the sake of the future.

"This petroleum industry—and I speak of it, as we must speak of it, as a world industry—is to-day launching out on adventurous schemes, undertaking expenditures that make our brains whirl. I remember that every year during the first twenty or thirty years in which I was in industry I heard some authority in the oil industry say that we had only twelve more years of oil resources; whatever the year, there were always just twelve more years of oil. There seemed to be a peculiar virtue in the number twelve. But that outlook has gone now, and we are talking of illimitable supplies over immeasurable areas. As the Minister has indicated, the old fields and the new fields which have been proved lie under areas occupied by the most turbulent

and independent-minded people who, politically, are not yet quite educated by the petroleum industry! But that problem rests really on the shoulders of the statesmen. When we consider—again reminding ourselves of the size of our own country—that the petroleum industry is now contemplating the provision of pipelines across the desert from the Persian Gulf to the Mediterranean, cutting out 3,200 miles of sea transport, to enable supplies of oil to be fed to Europe; when we think of the thirteen thousand million dollars which are being spent on oilfields and refineries throughout the world, let us cease to be parochial in Britain.

"The petroleum industry is to-day spending more than any other industry in Britain. It is an act of faith in the future of Britain, of faith in the triumph of private enterprise in Britain (applause). To-day there is not an industry in Britain that is not grateful for the lead of the petroleum industry in this great act of faith. The engineering industry will benefit because it will give us the chance of developing the production of refining equipment. As a member of the chemical industry, I say that that industry will welcome this development of the petroleum industry in Britain, because it will enhance and enlarge enormously the range of our chemical raw materials. The whole country will benefit—even the gas industry, that Government monopoly. I can even visualize—and I give this idea to Mr Gaitskell—gas grids throughout the country for which the major source of supply will be the oil industry.

"We in industry generally are in the debt of the industry whose health I am to propose, because primarily it has demanded from those in it a fresh attack on fundamental problems, the solution of fundamental difficulties; the whole of industry lies under debt to the engineers and to the scientists of the petroleum industry. On behalf of industry in Britain I wish continuing prosperity to the petroleum industry, continuing success in achievement and the continuing maintenance of their independence (applause).

"I have the privilege of coupling with this toast the name of Sir Andrew Agnew, and I cannot tell you how much pleasure it gives me, because Sir Andrew and I are old friends. Sir Andrew Agnew and I have come through many difficult times, as well as good times, and I do want to pay tribute to him. Not only has he been a great leader of his own company in the petroleum industry, but he was a great leader as Chairman of the Petroleum Board during the war (hear, hear). I also was the Chairman of a Government Board during the war, and I can assure you that during times of difficulty—and no chairman of any Government Board under any Government did not experience difficulties—it was to Sir Andrew Agnew and his colleagues that I went for discussion, for advice and for active help; always it was available and forthcoming. The work which the Petroleum Board did during the war has not yet been told fully. One day the story will be told, and we shall know then what Sir Andrew Agnew meant to Britain in its times of difficulty (applause).

"I give you the toast of 'The Petroleum Industry' with all my heart, and I couple with it the name of my friend, Sir Andrew Agnew."

Sir Andrew Replies

Sir Andrew Agnew, C.B.E., responding:

"The reply to the toast which has just been proposed by our honoured and most welcome guest deserves the very highest effort, and I am proud indeed to have the opportunity of making it; my effort will be sincere and will be the best that I can do.

"How fortunate we are to-night in having with us as one of our guests and as proposer of the toast of 'The Petroleum

Industry' that very great man and leader of industry, Sir Frederick Bain. It has been one of my very great pleasures to have had Sir Frederick as a personal friend for more than twenty years. I wonder if those of us around the table to-night realize just what sort of a man we have in Sir Frederick, the President of the Federation of British Industries and one of the leading figures in that great industrial concern the Imperial Chemical Industries; in the first world war as a Captain in that famous and hard-fighting regiment the Gordon Highlanders, he was accepting the challenge to the British Empire as to its right to conduct its own affairs in its own way and to uphold its treaties with its neighbours. Sir Frederick came out of that war wounded and honoured, and turned himself to the pursuits of industry with all the determination and with all the dash which he had shown as a soldier. The results are evident to-day. Sir Frederick has been kind enough to say some very nice things about the petroleum industry and about the co-operation which has existed in the past between that industry and the chemical industry with which he is most closely connected; further, he has ventured into the realm of prophesy as to even greater co-operation between these two great industries in the future. In my opinion, his ideas about the future are absolutely sound. These two industries must continue to co-operate, as they have it in their power to help industry generally, and in fact to help mankind.

"Mention has been made also of the efficiency of the petroleum industry. I have no hesitation, nor have I any false modesty, in accepting this tribute of efficiency on behalf of the petroleum industry for which I am now speaking. In my opinion the petroleum industry is well up in the lists as regards efficiency, and before coming to this dinner to-night, I gave some thought as to how this efficiency has been achieved. I believe that one outstanding reason for the efficiency of the petroleum industry can be described in one word, namely, staff. Having been connected with the industry now for over forty-five years and having seen its workings in a good many parts of the world, I can most sincerely say that the oil men one meets, whether at home or abroad, are, generally speaking, hand-picked. No trouble is too much in the choosing of technical or administrative staff.

"I am not being a bit modest when speaking of the industry which has just been toasted by Sir Frederick Bain. I know of no reason for being modest about an industry which, in my opinion, is second to none. I accept all the kind things that Sir Frederick has said with gratefulness and with no surprise. In fact, I am in that sort of mood which is often attributed to the Scot and which finds expression in the words of another well-known toast, namely 'Here's tae us, wha's like us'.

"I would like to touch very briefly on the work of the petroleum industry itself. Occasionally one might get the idea from seeing references in the Press and even from talks with friends, that the work of this industry consists mainly, if not entirely, in making journeys to foreign lands where concessions are obtained and where fabulous profits are immediately realized. To most of my audience here to-night it is almost unnecessary for me to state that such ideas are so much nonsense. It is true that the oil man searches the world over looking for possible new sources of petroleum. In every case, however, this is only the beginning, and in fact it may easily be—and frequently is—the beginning of a costly failure. Even after a concession has been obtained, there is no certainty of oil production following automatically. Geological work of a costly and arduous nature is required and this goes on for years, whilst even in the most promising circumstances there has to be added to the geological efforts an enormous amount of administrative work,

again costly, because Nature apparently has decided that petroleum is mainly found in the more remote and in the least accessible parts of the world. This means building of every kind: houses, workshops, tanks, schools, and in fact everything that is necessary, not only for the production of oil but also for the amenities without which such production could not even be thought of. In the case of failure—either complete failure or failure to prove economic production—those concerned must just swallow the loss and hope for better things next time. Even in the case of success, there is still much to be done in the way of planning and erecting refineries and in the way of bringing production to the point of consumption.

"The Minister has said that only some 2 per cent of the world's oil occurs within the British Empire. The British oil men, therefore, have made bricks without straw; they have built up an industry outside their own Empire, and have done a job which in my opinion is second to none. It is to the men who have done and are doing these things that I address myself, and not to the occasional concession-hunter who turns himself into a so-called 'oil-magnate' overnight. The oil industry has been built up by men who have not been afraid of hard work and plenty of it. In fact, I state quite definitely that anyone who is looking for an easy life had better keep clear of the oil industry. He won't achieve his ambition there.

"In this industry I am glad to think that there is helpful co-operation, but there is also keen and well-sustained rivalry, and the man or woman who is not prepared to stand up to this rivalry will have no place. It is for this reason that I have already spoken about the question of staff being one of the vital problems which the leaders of the oil industry have kept in mind and must always keep in mind. The successful director or manager should, in my opinion, adhere to the principle that the holding down of a job is not good enough. To put it quite bluntly, it seems to me that to make himself a success a man must first of all make himself redundant by providing for himself an understudy who can do the job just as well without his chief. There is unlimited scope, provided the will to work is there, and in this I believe that our leaders in this great industry have been particularly successful."

"The President"

The Right Hon. Hugh Gaitskell:

"Before I go, however, I would like to express on your behalf, if I may be permitted to do so, our appreciation of the way in which the President has presided over this gathering. We have already honoured the toast of 'The Institute of Petroleum,' coupled with his name. But there is something attractive about making a personal gesture to him and drinking his health, to show our appreciation of what he has done for the Institute and what he is still going to do for it in the thirteen months or so of office that remain to him.

"I invite you to drink to the health of Mr Evans and to wish him the best of luck during his next year of office."

(The toast was honoured with enthusiasm, and the President briefly responded.)

FORTHCOMING MEETINGS

INSTITUTE MEETINGS

Examination of Crude Oils in Relation to Geological Formations. F. Morton. At 26 Portland Place, London, W.1, 5.30 p.m. (tea 5 p.m.), May 11.

MEETINGS OF OTHER SOCIETIES

Fabrication of Chemical Plant in Stainless Steel. A. C. Branch and J. L. Sweeten. Institution of Chemical Engineers, at Geological Society, Burlington House, London, 5.30 p.m., May 17.

Scientific Information Services. Sir A. C. Egerton. Royal Society of Arts, London, 2.30 p.m., May 18.

CONTINUOUS WAX SWEATING PROCESS

By H. TER MEULEN

Introduction

The sweating process has been in use for many years for the manufacture of paraffin waxes from mixtures of wax and oil containing more than 60 per cent of the former. This process was for a long period the only one in existence for the purpose, and it has only recently found a competitor in the solvent de-oiling process.

The sweating process involves the production of a solid wax-oil mixture as a layer which is supported by a perforated plate or wire gauze. Once this "build-up" has been obtained the sweating process can be put into operation by raising the temperature gradually, so that oil, saturated with wax, continuously liquefies in small amounts. The liquid "sweats out" of the cake downwards and passes through the perforated plate or wire gauze. The waxcake becomes thinner and the oil content decreases until at a certain moment the oil content is low enough for the remaining cake to be considered as paraffin wax. Then the cake is melted completely and the product is called "sweat wax".

Thus the process has to be performed in two stages: firstly the building up and cooling of the solid mixture of wax and oil in a suitable form for sweating, and secondly the heating up of the solid layer so as to remove all oil fractions.

The equipment which has been in use during the long lifetime of this process has, of course, been mechanically improved, but this improvement cannot be compared with the enormous development which has taken place generally in the oil industry. The development of the mechanical equipment for the sweating process has mainly been in providing bigger units for batch operation. The only plant ever set up for continuous operation, as far as is known to the author, was that installed by the Shell Group more than thirty years ago and repeated a few years ago with completely modernized equipment. The latter installation forms the subject of the present discussion.

As has been said, the sweating process involves two stages: first cooling, and secondly heating, of the wax-oil mixture. The equipment for the process has to be designed so as to enable these two operations to be performed alternately. The formation of the solid cake can be carried out in one or other of three main types of container:

(*a*) A pan type (shallow and square or rectangular).

(*b*) A box type (deeper than (*a*) but of similar horizontal cross section).

(*c*) A tank type (round, with a minimum height of about 3 ft).

Further, the solid cake can be formed on either of two foundations, viz., mainly on top of a water layer or on a dry bottom. The latter is practically only in use with the so-called "Alanmor" tank-sweater (group (*c*)).

All three above types of sweater are based on the so-called "batch system", in which the container itself is filled with water (except in the case of the "Alanmor" stove) to the perforated bottom and the liquid wax-oil mixture at 70° to 80° C is introduced on top of the water layer. After this the wax-oil mixture is cooled by various means. This can be done by simply cooling with air, or in a more complicated way by means of water flowing through tubes which are embedded in the mixture. The latter method is in general use with containers of types (*b*) and (*c*), as here the wax layer is too thick for outside air cooling

Fig. 1.—Trays stacked on a lorry and being filled with molten wax.

only. After a sufficient degree of solidification has been attained, the heating process is started by either:

(*a*) circulating heated air around the pans (type (*a*)), or
(*b*) circulating warm water through the tubes (types (*b*) and (*c*))

An unsatisfactory feature of all these systems is that the structure in which the wax-oil layer is formed and sweated out is throughout the process located in a single building in which both low- and high-temperature operations are performed. Owing to the alternate cooling and heating of the building or structure, it is obvious that the thermal efficiency of such a system must be lower than that of a continuous system, where the once-heated building never cools off.

The continuous process has overcome this drawback by forming the solid wax cakes in a movable pan structure which passes alternately through a cooling tunnel and a heating tunnel. Thus cooling and heating conditions are respectively constant, a product of constant quality is assured and the process itself requires minimum operating labour for control. The control also is simple, as it is mechanical and is maintained under conditions which, once established, remain uniformly constant for any given grade of wax.

Description of the Installation

For this construction the pan type sweater is chosen, air-cooling or heating being applied while the charge is in movement. A number of pans (16 in all) are stacked in two tiers on a lorry (see Fig. 1). The net content of wax-oil layer per lorry is 4·4 cu.m. or 3·2 tons. In all, 23 lorries are available, of which 14 lorries are continuously in the sweating tunnel.

As already stated, this installation contains two main sections, viz., the cooling tunnel and the sweating tunnel. Both contain rails on which a train of lorries can run. The transfer of a lorry from one tunnel to the other is performed by way of a small cross rail and traverse car, the rails of which can be seen in Fig. 2. This is the transfer from the cooling tunnel to the sweating tunnel.

Fig. 2.—Car entering sweating tunnel.

The movement of the lorries in the two tunnels is effected mechanically. The train in the sweating tunnel stands on rails sloping slightly upwards to the melting chamber. The rails into the melting chamber slope downwards. Further the train can be pushed forward by means of a hydraulic ram with rods going through the end wall of the tunnel. To prevent the train in the tunnel from running backwards an automatic lock is provided behind lorry No. 14, so that the train remains standing when the ram rods are retracted.

The rails of the cooling tunnel slope downwards from the melting chamber to the filling header, and from there onwards the rails are laid horizontally. The train in the horizontal cooling section is moved forward by means of a cable hooked on to the last lorry (No. 23), and the cable is pulled by a winch located outside the end of the tunnel.

A lock is also provided in front of car No. 16, and this lock cannot be removed as long as no traverse car is standing in front of the rails to take up a lorry for transfer to the sweating tunnel.

The removal of the empty lorry from the melting chamber on to the rails of the cooling tunnel is again performed by cross rails and a hand-operated traverse car. Once the lorry is on the rails in the cooling tunnel it runs by itself towards the filling point, thereby completing the cycle over the cooling and sweating tunnels. The only manual labour in the movement of the lorries is therefore the transfer of the lorries on the traverse cars from the cooling tunnel to the sweating tunnel and from the melting chamber to the cooling tunnel.

The cooling of the filled lorries takes place by natural circulation of air along the train. For this reason the cooling tunnel resembles an open shed which, for climatic reasons in this case, has been half closed in. In tropical climates no side walls are used, but only a roof above the train of lorries to protect them against rain and sun.

For winter conditions, when cooling might be too fast, the closed section alone could be used, shortening the train so much that no lorries would be standing outside.

Air circulation is obtained by placing a number of small stacks on the closed-in section. These stacks can be closed in winter periods to control air circulation.

The sweating section, of course, is a fully closed tunnel in which heated air is circulated by means of a ventilator. The air is blown through a tubular steam

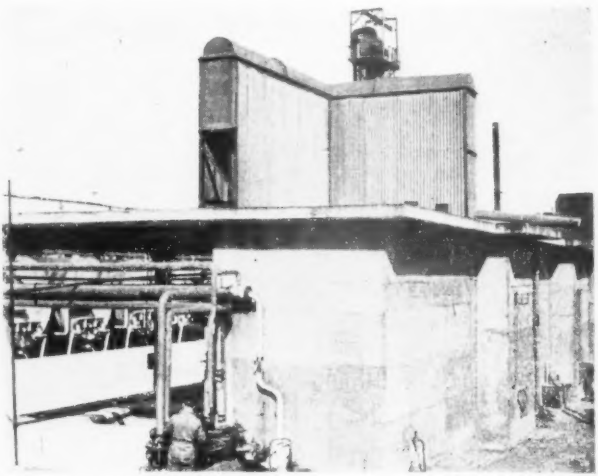


Fig. 3.—The continuous sweating unit from the rear.

heater, the heat-input being automatically controlled by a temperature controller on the air outlet. The heated air enters the tunnel at the end near the melting chamber. The latter is separated from the sweating tunnel by a sliding door, which can be raised so as to connect both sections. Fig. 3 shows the layout of the sweating tunnel seen from the melting room end. The following parts can be seen:

Two housings on the top of the tunnel for the two sliding doors, one separating the melting chamber and the sweating tunnel and one separating the melting chamber and the cooling tunnel. In the middle of the tunnel roof, the housing for the ventilator and heater. On the right side of the tunnel, four air distribution columns provided with dampers, and also the handles which control the setting of levers so as to adjust the amount of air entering in four places into the tunnel.

This air introduction in four places is provided so as to make it possible to adjust the temperature gradient in the hottest end of the tunnel.

The air, which cools down during its passage through the tunnel, is recirculated through a channel on top of the sweating tunnel to the ventilator. A schematic layout of the air flow is also given in Fig. 4.

The temperature to which the air is heated depends on the melting-point of the sweat wax to be produced. In general it is controlled to about 2° C below this melting-point, or:

For producing hard wax, melting-point 138°–140° F at about 58° C.
For producing soft wax, melting-point 127°–130° F at about 52° C.

Dial thermometers are located at four points (2 to 5) on the sweating tunnel (see Fig. 4). In addition a recording controlling thermometer is placed in the air entering the tunnel, whilst another thermometer is located in the melting chamber.

The melting chamber can only contain one lorry, which is then standing on the traverse car. In the chamber a number of steam-heated tubes are attached to one wall, so that the temperature in this chamber can quickly be raised for melting out the sweat wax.

In every lorry each pan has its own drainpipe, which is of the swing type. In the upward position the drain is closed. In the downward position the drain is open, and foots oil or sweat oil can flow from the pans.

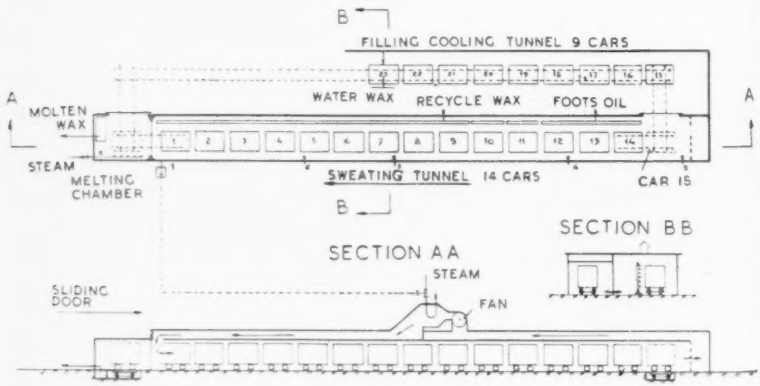


Fig. 4

Alongside the train of lorries in the sweating tunnel a long drain trough is laid, into which the lorries can drain foots oil or sweat oil. This trough is divided into various sections, viz.:

1. A long pan along lorries Nos. 12 to 14.
2. Two separate pans along lorries Nos. 10 and 11.
3. A long section along lorries Nos. 1 to 9.

The two separate pans along lorries 10 and 11 serve for switching the drainage of these lorries either to foots oil or to sweat oil.

The troughs under and along lorries Nos. 1 to 9 and 12 to 14 are connected to small tanks outside the tunnel and sweat oil and foots oil can be pumped away from these tanks.

The melting chamber also has a collecting pan along the lorry, in which the sweat wax accumulates and from which it is pumped to storage.

Another collecting ditch is provided beside car No. 16 in the cooling tunnel, where the water under the perforated plates in the 16 pans per lorry can be drained off before the lorry is moved into the sweating tunnel.

The filling apparatus for this type of installation (see Fig. 1) is a column with 16 spouts in two rows of 8. These spouts just fit in between the trays of the lorry, when it is moved in front of the column. Two lines to the top of the column supply liquid wax-oil mixture and water. First the water valve is opened and each tray is filled with so much water that the perforated plates are just flooded. Then wax-oil valve is opened and the trays further filled to about 1 cm below the top. The vertical filling column is finally drained into the bottom tray so as to avoid plugging.

For the sake of completeness a picture of the cooling tunnel is shown in Fig. 5, where the draining of the lorries can be seen.

Description of the Process

In normal operation all the lorries in the sweating and cooling tunnels contain wax-oil mixtures in various stages of processing, and in the description of the process the cycle of one lorry will be followed.

A lorry which arrives empty at the filling place is filled there, according to the method described above. Here it remains for a certain time, which depends on the rate at which the tunnel is operated. As a lorry contains, when full, 3·2 tons of charging material and normally yields 1·4 tons of finished sweat wax, it can be seen that by filling twelve lorries per day the production will be 16·8 tons per day. Filling at a quicker rate will increase the capacity of the plant but not exactly pro rata; the yield

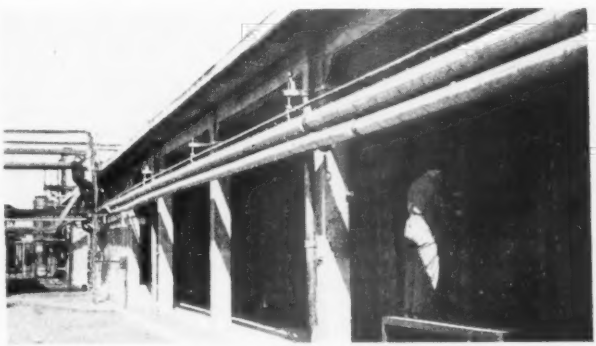


Fig. 5.—The cooling tunnel.

per lorry would actually decrease. Consequently the installation has a maximum capacity, when filling rate and yield economically balance each other.

Assuming that the economical rate of filling has been found under certain conditions to be twelve lorries per day, the above-mentioned filled lorry will remain for two hours on the filling place. During this time a thin layer of solidified wax will already have formed on the surface, and this prevents spillage of the charge when the lorry is moved.

In general, the sequence of operations of moving the lorries is as follows:

Lorry No. 1, which should now be fully sweated, is inspected and found to be ready for melting out. The sliding door between sweating tunnel and melting chamber is, therefore, raised and the whole train in the sweating tunnel is pushed forward one lorry length. Car No. 1 runs slowly into the melting chamber, and the sliding door is lowered again. Steam is put through the coils in the melting chamber so as to melt out the contents of the lorry.

Place No. 15 is now free and the traverse car is brought from the sweating section to the cooling section. The lock on lorry No. 16 is released and the train formed by lorries Nos. 16 to 23 is pulled by the winch and cable, whereby lorry No. 16 comes to rest on the traverse car. The lock on the new lorry on place 16 is replaced again and the traverse car is moved over into the sweating tunnel, where, in the meantime, the hydraulic ram has been retracted. The lock under lorry No. 14 is also replaced. During these operations the contents of the lorry in the melting chamber are fully melted out, and the sliding door on the side is opened and this lorry is brought over into the cooling tunnel as far as the filling column, where filling can again take place. This completes the cycle, which must be repeated every two hours.

Inspection of all the lorries is possible in the sweating tunnel through inspection doors between lorries. Samples can also be drawn from all drains of each lorry for analysis.

The capacity of the tunnel is greatly increased when sweat-waxes of higher oil content, which may be required for certain purposes, are to be produced. In such cases, it may happen that the cooling period (8×2 hours $= 16$ hours) is not adequate and that not enough wax is solidified in the pans for a good sweating. It is then necessary to add a further number of lorries and extend the cooling train. As, however, sweating always takes longer than cooling, it will never be necessary to have more lorries in the cooling section than in the sweating section.

In the opinion of the author, the continuous sweating system is the most elegant for carrying out the sweating process. It yields a constant quality product and gives a regular daily production, which tends to reduce the requirements for intermediate storage.

U.S. NATURAL GAS PRODUCTION

Marketed production of natural gas in the U.S.A. during 1947 was 4,444,693 million cu. ft., an increase of 10 per cent over the 1946 peak of 4,030,605 million cu. ft., according to the U.S. Bureau of Mines.*

Total consumption in the U.S.A. in 1947 was 4,426,544 million cu. ft. (4,012,930 in 1946), divided as follows (in million cu. ft.): domestic, 802,150; commercial, 285,213; field, 933,761; carbon black manufacture, 484,882; petroleum refineries, 363,892; Portland cement plants, 60,499; miscellaneous industrial, 1,496,147.

Domestic consumers numbered 12,203,700 at the end of 1947, of which 2,719,800 used mixed natural and manufactured gases. Commercial consumers totalled 1,039,080, with 155,320 using mixed gases.

*U.S. Bur. Mines *Mineral Market Report No. MMS. 1687*, January 1949.

OUR MONOGRAM

The principle of utilizing a monogram for Institute purposes was agreed by Council many months ago. The aim since has been to secure a design with just that additional something to take it out of the well-worn monogram groove, a difficult task which has given rise to discussion on methods to secure such a design and of designs submitted.

Out of the blue came the design, outstanding on a sheet of monogram suggestions, outstanding because of its forcefulness combined with simplicity, outstanding because it had just that additional something to take it out of the ordinary.

This monogram design has been agreed by Council and is now in process of being utilized for Institute purposes. A print of the design heads this article.

The three-dimensional treatment of the lettering secures the necessary forcefulness to make it outstanding from the surround and from any normal context in which it may be placed.

This is further secured by the slight slope given to the lettering, normal printing practice being vertical. The slight slope is also more pleasing artistically as it breaks away from the stiff rigidity of the vertical.

The surround is two-dimensional and thin lined so that though it contains the monogram proper it is sufficiently subdued in treatment to leave the lettering outstanding.

The surround is composed of five concentric circles. The circle is the symbol of complete unity. Five loosely-connected circles are utilized by the Olympic Games to symbolize five continents (complete units) with a common interest in sport (loosely connected). In this case the loosely connected treatment is a symbolic and not an artistic requirement. In the petroleum industry there is a complete common interest which has a symbolic requirement of concentric circles.

Geology, production, transportation, refining, and marketing are five complete units, all working together in tight formation to form one complete unit—the petroleum industry; five independent circles bound together in the common effort to form one complete circular surround.

Our monogram has just that little something, a simple representation of the great industry with which, one way or another, we are all connected.

U.K. OIL PRODUCTION

Anglo-Iranian Oil Co. announce that crude oil production from their oilfields in the U.K. during 1948 is provisionally placed at 43,400 tons.

GERMAN GAS PRODUCTION

Production of natural gas in Germany during 1948 was 67,175,000 cu.m., a reduction of 13·6 per cent from the total for 1947. Details are:

	1000 *cu.m.*	
	1948	1947
Bentheim gasfield . .	60,391	71,621
Reitbrook oilfield . .	2,479	1,973
Steimbke oilfield . .	1,177	1,197
Nienhagen oilfield . .	1,102	993
Wesendorf oilfield . .	792	549
Heide oilfield . . .	741	701
Other oilfields . . .	493	710
Total . . .	67,175	77,744

PERSONAL NOTES

H. A. Bennett, M.Inst.Pet., general manager of Trinidad Petroleum Development Co. Ltd., has been appointed by H.E. the Governor of Trinidad to be a nominated member of the Legislative Council.

J. A. Rigby, A.M.Inst.Pet., wrote on February 2 that he was leaving Calcutta for Lucknow to there supervise the installation of a 7500-gal underground tank.

W. S. Ault, F.Inst.Pet., chief technical adviser of Shell-Mex & B.P. Ltd. since September 1946, has been appointed chief chemist of Shell Petroleum Co. Ltd. and of the Anglo-Saxon Petroleum Co. Ltd. A Member of Council of the Institute, Mr Ault joined Shell Refineries Ltd. in 1936, was for five years (1939–44) at Suez with the Anglo-Egyptian Oilfields Ltd., and then for rather more than two years at Stanlow as assistant refinery manager.

J. A. Oriel, F.Inst.Pet., is relinquishing his positions as chief chemist of Shell Petroleum Co. Ltd. and of Anglo-Saxon Petroleum Co. Ltd., but will continue as general manager of the "Shell" Refining and Marketing Co. Ltd.

Col. S. J. M. Auld, F.Inst.Pet., chairman of the Institute's Research Group No. 2, is among those appointed by the Medical Research Council to advise and assist in the prosecution of research on the carcinogenic action of mineral oils.

In a recent Council Commentary it was reported that *Dr Simon Papp* had been sentenced to death by a Hungarian People's Court. We now learn that this sentence has been reduced to life imprisonment.

F. H. Billups, Standard Oil Co. (New Jersey) marketing adviser for Europe and North Africa since March 1947, has been appointed assistant marketing co-ordinator of the company.

C. S. Windebank, F.Inst.Pet., became managing director of Esso Development Co. Ltd. on March 1 in succession to Hugh C. Tett. He joined International Association (Petroleum Industry) Ltd. in 1937, was appointed manager of Esso European Laboratories in 1946, and manager of Esso Development Research Department on January 1, 1947.

D. A. C. Dewdney, F.Inst.Pet., succeeds Mr Windebank as manager of Esso Development Co. Ltd. Research Department. He joined International Association (Petroleum Industry) Ltd. in 1936, served in the R.A.F. 1940–5, and was made manager of the Development Department of Esso Development Co. in 1947.

T. C. R. Baker, F.Inst.Pet., has been appointed assistant manager of the Chemicals and Solvents Department of Anglo-American Oil Co.

R. D. Streeton, A.M.Inst.Pet., was on March 1 made manager of Anglo-American Oil Co.'s Chemicals and Solvents Department.

Luis de Florez, M.Inst. Pet., has recently moved to new offices at 116 East 30th Street, New York 16, N.Y.

Col. A. S. Osborne, O.B.E., M.C., has been appointed director of the Council of British Manufacturers of Petroleum Equipment as from April 1. *T. L. Bonstow*, F.Inst. Pet., is remaining with the Council as technical adviser.

B.S.I. STANDARDS

A new standard recently issued by the B.S.I. is 1414 : 1948 flanged steel outside-screw-and-yoke wedge gate valves for the petroleum industry. This is based on A.P.I. standard 600A, and details are provided for such valves with pressure ratings of 150 to 2500 p.s.i. Copies (price 7*s.* 6*d.* post free) are obtainable from the B.S.I. at 28 Victoria Street, London, S.W.1.

Reprints (price 3*s.* post free) of B.S. 489 : 1933 turbine oils, which has been out of stock, are now available from the B.S.I.

THE LIBRARY

To most Englishmen the word library conjures up a book-lined room, comfortable leather arm-chairs, a glowing fire and, above all else, silence.

In other words, a quiet, comfortable room where a man could read or work in undisturbed peace, but up to a few months ago, owing to circumstances beyond anyone's control, it would have been difficult to think of the library at Manson House as such a desirable haven.

Owing to the very cramped office accommodation, the library was the only room that could be used as a committee room; and owing to the size of Council the committee table occupied so much space that anything in the way of arm-chairs was out of the question. Members wishing to drop in and look up some reference found, only too often, that some committee was in occupation, and consequently the number of members using the library was very small.

All that is now, happily, a thing of the past. The Institute has taken over the top floor of Manson House and the large committee room on the first floor. Consequently the library is now used exclusively for its proper purpose.

Members who use it in the future will find it an attractive room with a beautiful Adam ceiling. Leather arm-chairs and writing desks have been provided, and morning coffee and afternoon tea can be bought at the new canteen which has just been opened.

The library itself is well stocked, and most of the world's publications dealing with petroleum matters are available. A qualified librarian is always present to

The staff canteen.

assist members in finding the references they require.

Members on leave from abroad will find all the current information on oil matters and notices of meetings of the Institute and other societies on the notice board, and the general secretary, one floor higher up, and the editor, on a floor still one higher, are always delighted to make their acquaintance.

OIL CONSUMERS' COUNCIL

The Minister of Fuel and Power has now appointed the Oil Consumers' Council which it was decided to set up after the dissolution of the Petroleum Board.

The Council will consider any matter affecting the sale and supply of petroleum products in the U.K., either as a result of representations from consumers or on the initiative of the Council. The conclusions of the Council will, in appropriate cases, be notified to the Minister, who may also ask the Council to report on specific matters.

Chairman of the Council is Sir William Palmer, K.B.E., C.B., chairman of the British Rayon Federation, chairman of the Building Materials Prices Committee, and vice-chairman of British Optical and Precision Engineers Ltd. The secretary is F. E. W. Barnett, M.C., of the Ministry of Fuel and Power.

Membership, which is for three years in the first instance, includes: E. A. Evans, president of the Institute of Petroleum and chief chemist of the Research Department, Messrs C. C. Wakefield & Co. Ltd.; C. M. Merrick, managing director and general manager, Shell-Mex and B.P. Ltd., chairman of the U.K. Petroleum Industry Advisory Committee; L. Sinclair, director, Anglo-American Oil Co. Ltd., member of U.K. Petroleum Industry Advisory Committee; and R. H. G. Sutton, director and manager, Messrs Urquharts (1926) Ltd., president of the Oil Burner Manufacturers' Association Ltd.

COUNCIL COMMENTARY

THERE was a fair attendance of Council on February 9 at Manson House, with the President in the chair, and a good deal of time and thought was expended on the report from the Ad Hoc Committee of Chairmen dealing with the financial situation of the Institute at the present time.

Prior to this, the normal passing of minutes and acceptance of various Council committee reports was dealt with.

Mr H. E. F. Pracy, on behalf of Election Committee, after presenting his report, which was accepted, drew Council's attention to the fact that many application forms arrived without the additional information requested from proposers, and informed Council that printed slips were now being attached to all application forms drawing attention to the importance of such a letter.

The report from the House Committee, presented by Colonel S. J. M. Auld, was approved and information about the Annual Dinner was presented by the general secretary.

The closing date for receiving ballot papers in connexion with the Council ballot was decided as April 8, and a design of crest for the Institute, prepared by the College of Heralds, consisting of a red archaeopteryx on a gold ground, was inspected. The recommendation of the Crest Sub-committee was accepted that we should adopt this as the crest of the Institute, to be accompanied normally, or used in conjunction with the words "The Institute of Petroleum".

On Mr C. A. P. Southwell's resignation from the committee of the Fourth Empire Mining and Metallurgical Congress of Organizing Committee, it was decided that the work was sufficiently complete for Mr T. Dewhurst to remain the Institute's one representative without replacement for Mr Southwell.

Having disposed of the more routine matters, the attention of Council was devoted to a careful examination and discussion of the report of the Ad Hoc Committee of Chairmen on the financial position.

Expenditure in the last year or two has increased very largely, with the expanding activities of the Institute. It was agreed that this expansion is both justified and necessary, but it has involved extra expenses in rent for increased accommodation, for salaries, and for general outgoings. The costs of publications have gone up, due to increased charges for printing and materials, and the issue of the *I.P. Review* during the last two years has involved the Institute in additional expense. The cost of the publications supplied to each member represents a very considerable portion of the subscription and there are many other facilities—technical and standardization, library, meetings, etc. —which also have to be provided.

It was pointed out that the membership subscription to the Institute, unlike almost everything else, was no higher than in pre-war days, and some consideration was given to the desirability of raising this. Every possibility of economy in working will be explored, but it was generally agreed that substantial reductions in expenditure could not be achieved without abandoning activities which are necessary to the welfare both of the Institute and of an expanding industry. It remained to consider the means whereby the income of the Institute could be increased to enable these necessary commitments to be met.

"Tubular air heaters of welded construction", reprinted from *The Engineer*, is available in booklet form from Yarrow & Co. Ltd., Scotstoun, Glasgow. An illustrated leaflet on the firm's X-ray and mechanical testing laboratory is also available.

U.K. PETROLEUM CONSUMPTION

In the accompanying table are given details of the quantities of petroleum products entered for home consumption on payment of Customs Duty.*

These figures do not include the comparatively small quantities of similar products manufactured in the U.K. from indigenous raw materials, but they do form a guide to the requirement of petroleum products for internal consumption.

Comparing the 1948 and 1947 figures it will be noted that only two products —motor spirit and gas oil—were made available for consumption in lower quantities. Particularly noticeable is the very large increase in the apparent consumption of fuel oil other than for road vehicles from 608·5 million gallons in 1947 to 1558·4 in 1948. Total consumption of all oils increased by 30 per cent.

Taking the year 1938 as a basis with an index figure of 100, it is noted that, with the exception of motor spirit, the use of which is artificially curtailed by rationing, there has been a steady upward trend in the consumption of all oils. This is particularly noticeable in the case of industrial fuel oil, the consumption of which in 1948 was over four times as great as in 1938. Although gas oil consumption showed a similar increase, there was a slight decline in 1948 in comparison with the peak of 1947.

In the aggregate the consumption in 1946 was 6 per cent higher than in 1938, in 1947 it was 44 per cent higher, and in 1948 was 88 per cent higher.

	1948		1947		1946		1938
	Million gal.	*Index (1938 = 100)*	Million gal.	*Index (1938 = 100)*	Million gal.	*Index (1938 = 100)*	Million gal.
LIGHT OILS:							
Motor spirit	1,260·1	*93*	1,357·3	*101*	1,185·5	*88*	1,348·4
Other sorts	48·3	*142*	46·2	*136*	41·7	*123*	34·0
HEAVY OILS:							
Road fuel oil	195·5	*227*	167·2	*194*	142·4	*165*	86·2
Other fuel oil	1,558·4	*531*	608·5	*207*	142·8	*49*	293·7
Kerosine	477·6	*231*	415·5	*201*	356·0	*172*	206·5
Lubricating oil	156·9	*121*	152·3	*117*	139·9	*108*	130·0
Gas oil	365·2	*512*	383·0	*537*	290·1	*407*	71·3
Other heavy oils	15·9	*248*	9·0	*141*	4·1	*64*	6·4
Total	4,077·9	*188*	3,139·0	*144*	2,302·5	*106*	2,176·5

* "Accounts relating to the trade and navigation of the United Kingdom, February 1949".

REFINING IN ITALY

Standard Oil Co. (New Jersey) has acquired a 50 per cent interest in a new company to own and operate the oil refineries at Bari and Leghorn, with a combined crude capacity of about 16,000 brl daily. The remaining 50 per cent interest will be held by the present owners, Azienda Nazionale Idrogenazione Combustibili. Plans to modernize the plants are being studied.

COLORIMETRY

Under the title of "A plain talk on colour measurement", A. J. Fawcett, chairman of The Tintometer Ltd., has published an interesting pamphlet "as a simple guide to industrial and scientific executives in their choice of methods and instruments for their own particular colour problem". In its text he explains the advantages, disadvantages, and limitations of several alternative methods.

NEW FUEL-SAVING DEVICE FOR OIL BURNERS

In 1944, following several years of development, one of the Shell laboratories in the United States produced a novel arrangement of air control for fully automatic gun-type pressure jet burners for use in domestic installations. The patented device, known as the "Shell-designed Combustion Head", has been offered royalty-free in the United Kingdom and elsewhere to all oil-burner manufacturers who may wish to incorporate it into their burners. With a burner so modified, it is quite simple to make the necessary adjustments and to leave it running throughout a heating season so that a high combustion efficiency is obtained and the heating surfaces of the boilers remain remarkably clean throughout the season.

Recently burners with this combustion head have been installed in the houses of eighteen employees, and statistics over 2½ years show savings ranging from 14 to 36 per cent of the annual consumption.

It is known that the more orthodox type of air control can be tuned by a skilled man to an adequate standard of efficiency, but surveys have shown clearly that in any zone a very high percentage of the domestic installations are being operated at an efficiency well below that required by official standards, and this state of affairs is associated with a significant waste of oil fuel.

The use of the new combustion head would ensure the correct and efficient mixture of oil and air, and, because it is easily adjusted and remains tuned, its general adoption by the burner industry would result in the more efficient combustion of oil fuel, better domestic heating and an atmosphere more free of smoke.

Petrochemicals Ltd. will be exhibiting at the B.I.F. (Olympia), where technicians will be present to provide information on petroleum-derived chemicals.

GOLF MEETING

A Golf Meeting will be held at Coombe Hill Golf Club on Tuesday, May 31, 1949.

Coombe Hill is one of the loveliest courses in the south of England. Originally a deer forest, each hole is fringed by woods, and although not long as modern courses go, there can be few more interesting to play. The greens in particular are about the best among inland courses.

The Club House is certainly the most luxurious in the country, and members who find their golf disappointing will at any rate enjoy its amenities. Coombe Hill is thirty minutes' journey by train from Waterloo.

The meeting will consist of a challenge match between London and the provincial Branches, played on handicap, for a silver trophy. Singles will be played in the morning and fourballs in the afternoon.

The eighteenth at Coombe Hill.

It is hoped that many golfers among members, with high or low handicaps, will manage to play in what should be a most attractive social function.

Coombe Hill limit the numbers of visiting societies to sixty. Early entry, therefore, to the general secretary of the Institute (stating handicap and partners, if any) is particularly requested.

Charges—including lunch, tea, green fee, and gratuities—25*s*. Caddies are available, if required, at 10*s*. per round (including tip and lunch money).

SELECTIVE HYDROGENATION

The second of the joint meetings of the Stanlow Branch with the Liverpool sections of other scientific societies was held at Chester on February 9, when a lecture (organized by the S.C.I.) entitled "Some aspects of the selective hydrogenation of fats" was given by Professor T. P. Hilditch, F.R.S.

Selective hydrogenation, whereby saturated derivatives of unsaturated glycerides and other esters are not formed, on catalytic hydrogenation, until almost all the polyethenoid compounds present have been converted into the monoethenoid state, was first observed shortly before World War I during some of the earlier work on fat hardening. If, however, hydrogenation is carried out on the free acids and not the esters the selective action is far less marked; it has been pointed out by the lecturer (*Nature*, 1946, **157**, 586) that the effect known as the "selective hydrogenation of polyethenoid aliphatic compounds" is restricted to compounds in which a single $-CH_2-$ group separates two ethenoid groups. The lecturer dealt with the special properties of compounds containing the $-CH{:}CH.CH_2.CH{:}CH-$ system and stated that many of the effects observed could be interpreted on the assumption that the methylene group in this system is "reactive", i.e., contains a readily detachable hydrogen atom.

He explained that the "selectivity" in the hydrogenation of fatty compounds is also affected by mechanical conditions under which the experiment is carried out and that rapid agitation with high-speed stirrers is necessary, so that the liquid surfaces in contact with the catalyst are continually renewed.

Considerable work had recently been done by the Liverpool school on the hydrogenation (using Raney nickel) of elaeostearate esters, the mechanism of which had been examined in some detail, and results were given of tests on the hydrogenation of mixtures of the methyl esters of elaeostearic and oleic, linoleic and linolenic acids, showing the extent of the selectivity of hydrogenation.

The attendance at the lecture indicated that the policy of holding such joint meetings, at centres other than Liverpool, obviously met with the approval of members and, at the conclusion of the paper, a hearty vote of thanks was passed in response to the motion proposed by Mr P. N. Williams.

NEWS FROM BORNEO

Old friends of F. F. Marriott will be pleased to know that he is back again in his old hunting-ground of Borneo. Mrs Marriott and Jean have been with him but are returning home.

Those who remember Sarawak and Brunei in the old days will be interested to hear that Brunei is once more the scene of great activity, and that the Lutong Refinery in Sarawak is going strong. They will be particularly interested to know that the living conditions now resemble the pioneer days in Miri in the early 'twenties and in Kuala Belait and Seria in the early 'thirties, and that the staff are living in Kajang shacks and not in the palatial residences which were burnt by the Japs.

Games are as popular as ever. The Panaga golf course is becoming overcrowded and in need of extension. Tennis tournaments have recently been held and the men's doubles were won by those two old stagers C. R. Middleton and J. L. Andrews, playing from minus half fifteen.

J. L. Andrews is expecting to come home on leave shortly.

IRAN OIL PRODUCTION

Total crude oil production by the Anglo-Iranian Oil Co. in Iran during 1948 is provisionally placed at 24,870,000 tons.

The M.S. Explorador

BRITISH TANKERS FOR ARGENTINA

Two 9000-ton-d.w. tankers, the M.S. *Cazador* and the M.S. *Explorador*, have recently been launched from the Govan and Belfast yards of Messrs Harland & Wolff Ltd. for service with the Cia Estrella Maritima S.A., an Argentine associate of the Royal Dutch/Shell group.

An unusual feature of these oil-carrying vessels is the provision of first- and second-class passenger accommodation. This is because the Patagonian oilfields, from which the two ships will collect crude oil, lie in a remote region. The sea journey will offer a convenient alternative to the long and at times impossible journey by road and rail to Buenos Aires. The ships will also be used to transport crude from Venezuela and Colombia.

Both vessels are 425 ft in length, approximately 54 ft beam, and 31 ft in depth, with a service speed of 12 knots. The hulls are of welded construction and cargo is carried in 24 oil-tight compartments. Propelling machinery consists of a 6-cyl diesel engine of 4-cycle solid injection, direct reversing, single-acting type, with under-piston pressure induction. These vessels will be manned by Argentine officers and ratings and will fly the flag of the Republic of Argentina.

The M.S. Cazador

NOMOGRAMS AS A TOOL FOR THE TECHNOLOGIST—A CORRECTION

It is regretted that when this article appeared in the *I.P. Review* for September 1948 the lettering of Figs. 1 and 2 (p. 258) was incorrectly given. For Fig. 1 the order of the scales should be (left to right) *a*, *c*, and *b*. Similarly, in Fig. 2, the order should be *a*, *c*, and *b*, and the units per inch, S_a, S_c, and S_b.

Sulphonates from Petroleum is the title of a pamphlet on surface-active agents recently issued by Petromor Ltd. Copies are available from Public Relations Dept., 44A Dover Street, London, W.1.

PETROLEUM IN PARLIAMENT

Fuel Oil Consumption

The Minister of Fuel and Power, asked for figures of fuel oil consumption by separate industries in 1948, gave a written reply on February 24. He said that available figures covered only those firms which had actually converted from coal to oil since the start of the coal–oil conversion scheme and which individually used more than 100 tons of coal per annum before converting. The figures were:

Consumption of Fuel Oil in 1948 *Industries*	*Thousand tons*
Iron and steel	774
Engineering, ship-building, electrical goods and vehicles	363
Chemical and allied trades	262
Agriculture, food, drink and tobacco	194
Textiles, leather and clothing	192
Glass	123
Paper and printing	83
Building materials, etc.	23
Other industries	96
	2110

In addition, about 1,000,000 tons of fuel oil was consumed by firms using fuel oil before the coal–oil conversion started, or then using less than 100 tons of coal per annum.

Petrol Stations

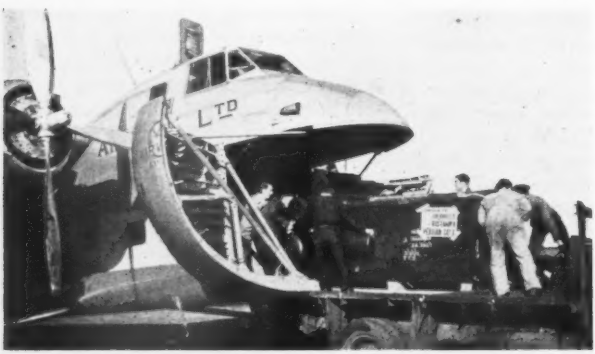
The Parliamentary Secretary to the Ministry of Transport said, on March 3, that the report of Lord Wateran's Committee on the design, location, and distribution of petrol-filling stations had been received. The Minister was about to consider the report and the action to be taken, including the question of publication.

Working Hours

The Minister of Labour was asked on February 15 why the Government delegate to the I.L.O. meeting in November 1948 abstained from voting on the resolution to introduce a 40-hour week in the petroleum industry. Mr Isaacs, in a written reply, said it was the policy of the Government that questions of working hours should be settled by the two sides of the industry concerned.

"AIR-LIFT" TO DAMMAM

When work on the 7-mile pier which Messrs John Howard & Co. Ltd. of London are building at Dammam, Saudi Arabia, for the Arabian-American Oil Co. was delayed over negotiations for transfer of plant from neighbouring areas, an approach was made to the Consolidated Pneumatic Tool Co. Ltd. The result, as seen in the photograph, was that a 3¼-ton air compressor with rock drills and other equipment was loaded into a Bristol freighter on Thursday, February 17, at Blackbushe Air port, Surrey, and was in operation at Dammam on Monday, February 21.



HIGHER HYDROCARBONS IN SERVICE*

By E. A. EVANS

(*President*)

THE use of the higher hydrocarbons in service is a long story. From the way it has been told it would appear as if the narrative can be varied to suit almost any audience or occasion. So true does this appear to be, that whenever the subject is being unfolded an eager gathering is assured, and many willing people are available to take part in the discussion. Of course the subject has many facets which include the wide range of application, and the influence of personal choice, both of which are in themselves formidable. There is, nevertheless, a lot of common ground which appears the same to most onlookers. If an analysis of the so-called divergences of opinion could be made I venture to think that two main classes would emerge:

1. Circumstances arising through variation in conditions of use;
2. General ignorance of the subject.

What the proportions would be I cannot guess, but I do know that there is an awful lot of ignorance, both with the buyer and the seller. If this is true, one may ask whose fault it is, and how it is to be remedied. Unfortunately, there is no immediate guiding hand. There are practically no educational establishments to which one can turn for instruction. The literature available is scattered and difficult to correlate, without fundamental knowledge. Lectures are given, of course, to various societies, but in my view they only touch the fringe of the subject.

Let us see how the subject has grown up. Five thousand years ago, when the sledge was the only form of transport, the early Egyptians had learned that the application of hog fat to the runners aided movement. When the roller was introduced, obviously no fat was required, but as soon as it was harnessed to an axle and bearing the need re-arose and became more important when war became a habit and speed of locomotion necessarily increased. This led to metal-lined hubs. No doubt to those peoples it was a wonderful discovery. Strangely enough no notable advance was made throughout the ages until the early part of the nineteenth century, when graphite and soapstone (talc) were mentioned. Grease appeared, but not as we know it to-day. It was a very crude affair, and contained almost anything imagination could procure.

Various fatty oils were known, but there seemed to be a conflict of opinion about their relative merits. People could not make up their minds which was the better, castor or sperm, in spite of the enormous difference in viscosity and other properties. When rape oil was introduced in the middle of the nineteenth century it indicated that a forward movement was under way.

THE PETROLEUM ERA

The new era began about 1865, when petroleum oils appeared on the scene. At first they were crude when compared with modern standards. They were just distillates. However, they served their purpose, and provided some rivalry between the U.S.A. and Russia. The engineer's only concern was whether they would lubricate the engines, so it was natural for them to design mechanical testing equipment, the best known being the Thurston tester. In principle it consisted of a shaft with its bearing housed in a pendulum. The position of the pendulum indicated the frictional torque. Many gallons of oil were sold upon the results from this tester. The various

* Summary of an address to the Stanlow Branch of the Institute of Petroleum, October 20, 1948.

distillates which were available gave the urge to measure viscosity, or fluidity. The flow down an inclined plane, or drops from a pipette, were the prototypes of the later viscometers. Flash-point was usually associated with the kerosines, but as time went on it became associated with the higher hydrocarbons. Simple tests survived for some years until competition increased; then we find that in the cotton mills oil vendors began to sell on coefficient of friction, measured on perhaps hundreds of spindles; steam engines had indicator diagrams made upon them; and all the art of the salesman was practised. During this period experience was gathered, even though explanations were not available.

With the dawn of the twentieth century came distinct progress in engineering. The internal combustion engine has been given the credit for the advances in petroleum oils. Doubtless it is true, because the quantities of oil which have been required have been so enormous. But we cannot afford to neglect the many other influences, including the steam turbine, electrical transformers, railways, and ball bearings.

All the standards of quality were based upon Penna oils, probably with good reason. They were good clean oils and responded to a minimum of purification. The danger was that people's minds became parochial and satisfied, both of which are against progress. Fortunately, the petroleum industry has never been lethargic or dormant. In spite of difficulties it has progressed. Progress in the other fields was made more difficult by the superiority of the Penna field. The Penna neutrals and the Penna bright stocks made good blending stocks for most purposes and commanded a high price. However, when solvent refining was discovered the disparities gradually disappeared. Now most fields contribute to the higher grades of oil.

The term quality can be dangerous, and can only be used in a relative way. What may be good quality for some applications can be bad quality for others. Resistance to oxidation has often been taken as a measure of quality. Now viscosity index is becoming a yardstick. Other considerations may well upset both. Quality must be reserved for specific applications.

The demand for standard specifications and even classifications presents considerable difficulties. The demand has arisen mainly from the desire of the small user to obtain a uniform oil from every supplier. Clearly a standard specification must embrace every oil which can reasonably be used for a particular type of machine. A specification thus becomes a definition of the lowest quality. Many large users issue their own specifications, but they endeavour to frame them to ensure that they obtain the particular quality they desire.

Any catalogue of oils for lubrication loses much of its value due to the many exceptions. "Bearing oils" has no meaning because of the many types of bearings and the conditions under which they run, with different speeds, loads, and temperatures. If an attempt were made to subdivide, the number of subdivisions would be embarrassingly large. Steam turbines lend themselves to an easier classification owing to the comparatively limited number of designs. Anyone who has had much experience with turbine users will have discovered how difficult it is to satisfy them. Turbines are very individualistic. Two turbines made from the same drawings often treat the oil differently. In one the oil will develop free acid rapidly, or produce sludge, or emulsions. Power station engineers have their fears and fancies, all of which makes the lot of the oil supplier more difficult.

Lubrication

All these difficulties and exceptions are a nuisance, but they have got to be

learned and provided for. The man who knows most of the answers is considered the greatest expert. Lubrication is undoubtedly a "know-how". Science has, during the past twenty years, come to our aid. Hardy's experiments on static friction confirmed certain beliefs. Langmuir helped us to a conception of oiliness. Bowden has explained friction by the stick-slip theory. And Finch has applied electron diffraction to reveal the oxide layer and emphasize the Beilby layer.

It might be difficult to assess the commercial value of the results of these academic workers, but I can state emphatically that they have helped me to obtain a broader view of the subject, and to tackle problems with added confidence.

Some people think that there is something phoney about lubricants and lubrication. Those of you who are interested in the subject should consult the two-volume report of the General Discussion on Lubrication held by the Institution of Mechanical Engineers in 1937. Those two volumes are excellent, but they do not help the beginner to obtain an idea how to use oils. My little book *Lubricating and allied oils* was written for the man who wants a start.

Experience has taught us that slow-moving parts under heavy loads require a viscous oil, and high speeds with light loads a light oil. Anything between the two can be a guess or based on experience. There are many simple cases such as shafting running at more or less atmospheric temperature indoors. But, when it comes to railway engine bearings, more difficulties are experienced due to the method of oil feed, variation in temperature, bouncing of the engine, and so on. A straight mineral oil will not ensure freedom from hot bearings. Probably it will suffice for many engines, but a railway cannot operate on averages. It must be positive. So, a quantity of rape oil is added. How much has been worked out by years of running experience. Some years ago it was suggested that 1 per cent oleic acid could replace the rape. During the last war, when rape was in short supply, experiments were made with oleic acid, with the result that the railways were glad to get back to rape. This is a clear case of experience which could not be solved by theory.

Steam turbines operate at high speeds, low bearing pressures, and an oil temperature varying from 110° to 160° F. It should, therefore, be quite simple to calculate the required viscosity. Such a calculation would not tell us how much oil would drain away from the bearing when the shaft comes to rest, and whether the remaining film is adequate on the moment of starting; and, particularly, what happens to the oil film at the steam end when the oil flow ceases and heat from the set flows to the uncooled bearing. On ships, gears are fitted to turbines to obtain the correct speed of rotation of the propellers. As they are lubricated with the turbine oil it is necessary to use a more viscous oil to take care of the gears.

Turbines, however well built, frequently do leak condensed steam into the oil; therefore the oil must have a low demulsification value. How low? Nobody knows, consequently the demand is for the lowest obtainable. So far so good. When the oil is in use its demulsification value increases. The user usually decides when it has reached a dangerous limit. At the best he can only make a guess. To meet this disability the refiner aims at providing an oil which does not increase its demulsification value more than he can help. The first step is to cease incorporating bright stock. Bright stock used to be used to keep down sludge formation.

To get round these little difficulties, which may be too much for the refiner, the chemist puts in additives.

Some engineers grumble about corrosion in their turbines. To console them, petroleum sulphonates have been suggested, but unfortunately they are apt to

upset the demulsification value. Other additives have had to be found in the last year or two. The latest have not been released for publication because they have not completed their journey through the patent offices.

For many years petrolatums and greases were used for gears. The viscous lubricants had to be employed to quieten the badly-made teeth surfaces, and to evade leakage from the boxes or back axle. As gears and oil sealing equipment improved, so less viscous oils became fashionable. Even to-day gear oils to S.A.E. 140 are widely used, whereas, for hypoid gears, S.A.E. 90 is mainly recommended because of the need to circulate the oil rapidly to keep the gears cool. For industrial purposes oils of much lower viscosity are used, the viscosity depending upon the loading on the teeth, not the load transmitted.

The introduction of the hypoid gear for back axles in 1927 by the Gleason Company, and first used by the Packard Company in 1928, revealed that neither mineral oils nor fatty oils were adequate for its lubrication.

Motor Lubricants

The development of mineral oils has undoubtedly been pushed forward by the development of the internal combustion engine. In the early days of motoring, oils having a viscosity of 300 sec Redwood I at 140° F were commonplace. Decarbonizing every 2000 to 3000 miles was necessary. Piston rings used to stick, etc. In 1912, however, there was a move to thinner oils. Crossley cars adopted a viscosity of 140 sec at 140° F. One American truck even used an oil having a viscosity of 80 sec in 1918. The 1914 war caused engineers to think afresh. The aero engine simply had to be improved in every way. In those days castor oil was the principal lubricant for aero engines. Obviously aero engines had to be designed to fly successfully on mineral oil. A point of interest is that throughout the development of the aero engine the mineral oil used has had a viscosity approximating to that of castor. It was not until well after World War I that the cry for less viscous oils for motor engines was heard in America. The cry was for the use of thinner oils, and so to save gasoline.

In Great Britain we moved slowly. For my part I found it difficult to see the advantage of saving money on petrol and expending more on oil. By using a thinner oil on a water-cooled engine, petrol consumption could be reduced, but the oil consumption would go up. With new cars and with engines in first-class condition there was something to be said for thinner oils, but with worn engines there was a lot to be said against. It is the overall purpose which must be considered when selling a commodity for an overall job. In other words, a judicious compromise must be made. But, were thinner oils the whole truth? Of course, they were not. They followed in the wake of self-starters. To overcome fluid friction on a cold day a big drain on the battery was experienced—too much for the battery. This meant a larger battery, increased cost, and more space. But that was not all. When an engine once fires, it must keep turning over at a minimum speed to ensure constant running. This can only be achieved if the frictional forces are less than the generated forces.

Thinner oils were inevitable in cold climates where starting difficulties were greatest. Thin oils also mean higher ring pressures, which in their turn, with higher engine speeds, demand more oil to the cylinder and hazards of greater wear. On the other side with a thinner oil, quicker circulation takes place and heat is thereby more quickly removed from the bearings.

The Mitchell Oil Co. has now moved to new premises at 24 St. Paul's Square, Birmingham 3. Temporary phone number is Central 8391.

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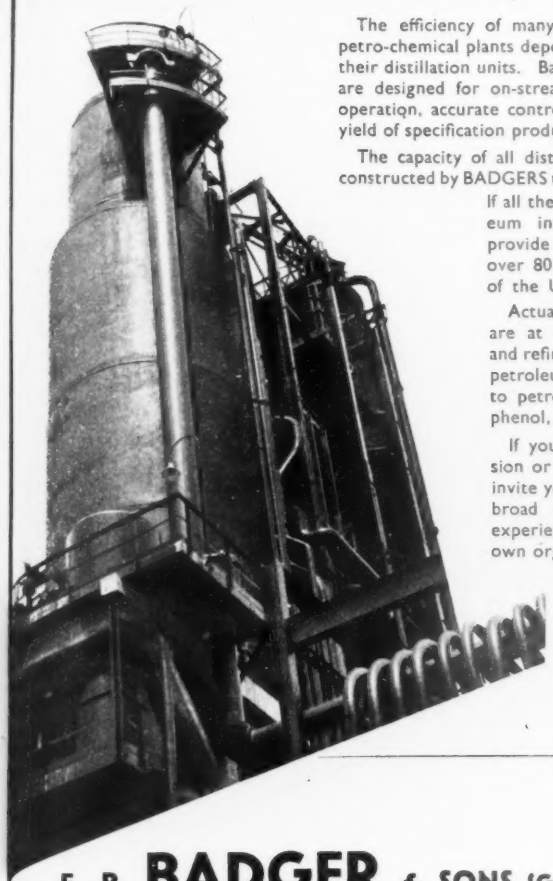

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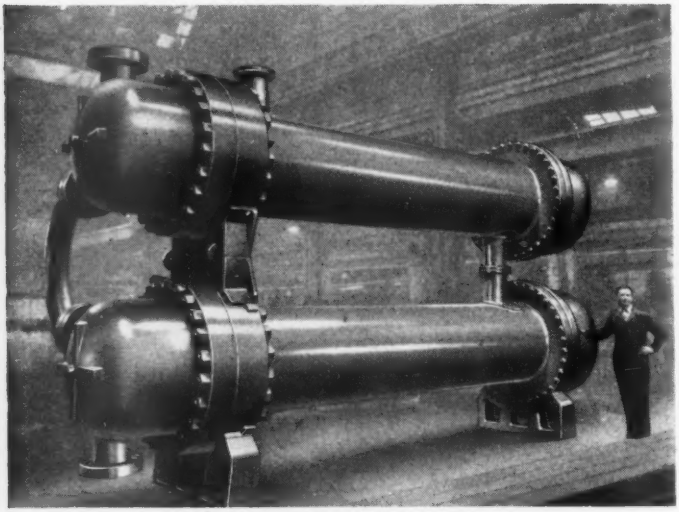

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